February 1961

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Farm Economics Research Division

STUDIES OF AGRICULTURAL PRODUCTION PROJECTIONS

An Annotated List

Prepared by Alfred L. Barr, Agricultural Economist

BARLOWE, R. Land resource requirements. In his Land resource economics: the political economy of rural and urban land resource use, pp. 82-111. Prentice-Hall, Englewood Cliffs, N. J. 1958.

An analysis is made of the adequacy of the land-resource supply with projections of the future land-resource requirements of the United States. The combination of a growing population and rising consumption levels calls for higher productivity standards on the land resources now in use and the addition of new land resources to our current economic base. Land requirements for the population of 225 million to be reached in the 1970's are projected at three levels of food consumption. At the low level (comparable to that of the 1935-39 period) 635 million acres of cropland equivalent – a 14-percent increase above the 1950-54 average – will be needed. Maintenance of the 1950-54 average level of per capita food consumption (medium level) would call for a 27-percent increase in cropland, and attainment of the high food-consumption level would call for a 42-percent increase. These projections assumed that crop and livestock yields would remain at their 1950-54 level. If productivity increases 20 percent above the 1950-54 level, only 7 percent more land would be required for the medium consumption level, and if productivity increases 40 percent, the same consumption level can be maintained on 7 percent less land. Projections of land requirements are also presented for forestry, housing, and residential sites, industrial and commercial sites, recreational, transportation, and service needs.

BARTON, G. T. Technological change, food needs, and aggregate resource adjustment. Jour. Farm Econ. 40(5):1429-1437. 1958.

An appraisal is made of the role of technology in the problems of agricultural adjustments. Rapid technological advance has been a major factor in the large increase in farm output in the United States since 1940. During this period, farm production tended to outrun growth in market demand for farm products. Domestic demand for farm products will continue to increase because of growth in population, which may reach 230 million by 1975 – 37 percent greater than in 1956, and a projected rise in consumer incomes. Thus, total farm output needs by 1975 may be 35 to 45 percent above the farm output of 1956. However, production is likely to continue to outrun demand for many years to come, as results of projections indicate that yield increases of 35 to 40 percent above those of 1951-53 appear to be attainable by 1975 from greater use of presently known technology. The need for an increase in total resources in agriculture will not come until the latter part of the 1956-75 period.

BARTON, G. T., and DALY, R. F. Prospects for agriculture in a growing economy. In Iowa State University Center for Agricultural Adjustment, Problems and policies of American agriculture, ch. 3. Iowa State University Press, Ames. 1959.

An appraisal is made of some of the major economic forces at work in shaping the past and probable future expansion in agriculture. Economic relationships, past trends, and studies of production capacity are used to indicate the nature and magnitude of probable changes in demand for farm products, output requirements, technological developments, shifts in resource use, and other changes in the organization of agriculture. Results of other Agricultural Research Service studies of production potentials and Agricultural Marketing Service projections of market requirements for farm production, noted in other items in this bibliography, were chief sources of data for this appraisal.

BARTON, G. T., and ROGERS, R. O. Farm output – past changes and projected needs. U. S. Dept. Agr. Agr. Inform. Bul. 162, 44 pp., illus. August 1956.

The publication evaluates future production requirements of individual products and groups of products in terms of acreage requirements based on 1951-53 yields, and yield requirements based on 1951-53 acreages. Estimates of future production needs are based on projections of potential demand for agricultural products in 1960 and 1975 under specific assumptions regarding economic and population growth. A marked increase in the need for livestock production is the dominating feature of the pattern of the production job ahead. Total crop production projected as needed in 1975 is about 25 percent above actual production in 1951-53, while the corresponding increase projected for livestock is approximately 45 percent. Projected needs for total farm output in 1975 are 34 percent above the volume produced in 1951-53. Compared with past achievements, the production job ahead in the United States seems substantial.

BLACK, J. D., and BONNEN, J. T. A balanced United States agriculture in 1965 and a statement by the NPA Agricultural Committee. Natl. Planning Assoc. Spec. Rpt. 42, 29 pp. Washington, D. C. 1956.

Within a general economic framework visualized for 1965, estimates are made of the national total of domestic consumption and exports of farm products for 1965 and then of the potential agricultural output of 1965. These two were then matched to see what surplus, if any, would result in 1965. The conclusion reached is that there are no shortages of any major production factors, except capital and credit on many individual farms, that will limit expansion of output. Production is expected to expand well beyond the 17-percent increase in consumption projected if controls are not imposed effectively.

BLACK, J. D., and MAAS, A. Future demands on land productivity. In U. S. Congress, House, the President's Materials Policy Commission, Resources for freedom, vol. 5, Selected reports to the Commission. Report to the President, 82d Cong., 2d sess., H. Doc. 527, pp. 63-75. U. S. Govt. Print. Off., Washington, D. C. 1952.

Two estimates are made of yields per acre and per animal unit to determine the possible increase in crop and livestock production resulting from greater use of technology by 1975:

(1) Estimates of yields of individual crops, which will result by 1975 from the full, efficient, and economic application of available technology to the current acreage of crop and grazing land, and similarly the production of livestock to utilize the feed and forage crops produced.

(2) Estimates based on a projection to 1975 of the yield likely to come from such application of available techniques as can reasonably be expected on the basis of past experience.

United States agricultural requirements can be met by 1975, it was concluded, without adding in any significant way to the 1,142 million acres now in farms. This can be done by improving or upgrading the use of land now in farms and bringing in new land only to offset any farm acreages taken out for urban and other uses.

Other articles included in the President's Materials Policy Commission report are:

"Improving Agricultural Resources," vol. I, pp. 45-50.

"Domestic Timber Resources," vol. V, pp. 33-46.

"United States Fertilizer Resources," vol. V, pp. 76-83.

CHRISTENSEN, R. P., JOHNSON, S. E., and BAUMANN, R. V. Production prospects for wheat, feed, and livestock, 1960-65. U. S. Agr. Res. Serv. ARS 43-115, 47 pp., illus. 1959.

The report considers production prospects for wheat, feed grains, and livestock in the years 1960-65. Recent trends were examined and potential production and uses were projected. With a continuation of present prices, costs, and farm programs (including 28 million acres in the Conservation Reserve), increased demand arising from population growth is likely to be more than offset by expanded output resulting from continued increases in crop and livestock production. If projected yields and output materialize, the 1959 levels of exports and domestic per capita consumption of livestock products can be maintained on 15 to 18 million fewer acres of wheat and feed grains than were harvested in 1959. If annual wheat exports are reduced from the projected 450 million to 250 million bushels, the excess of wheat-feed grain capacity might be equivalent to 25 million harvested acres excluding the acreage in the Conservation Reserve. If the wheat and feed grains produced on the 15 to 18 million excess acres were fed to additional meat animals, the number of pounds of red meat available per person would rise from 158 pounds in 1959 to 181 pounds in 1965. An increase of this magnitude in red meat supplies would mean price trouble for livestock producers.

CLAWSON, M., HELD, R. B., and STODDARD, C. H. Land for the future. 570 pp. Published for Resources for the Future, Inc., Johns Hopkins Press, Baltimore. 1960.

The book covers present and future requirements of land for urban uses, recreation, agriculture, forestry, grazing, and other miscellaneous uses.

In chapter IV, "Agricultural Land Use," projections of the demand and supply of agricultural commodities for the years 1980 and 2000 are presented. Projections indicate an increase in total demand for agricultural products of 50 percent by 1980 and 116 percent by 2000 above the 1954-56 level. Projections of yields of important crops for 1980 and 2000 and the acreage of land required to produce the demanded quantities of food indicate that in the next 40 years, surpluses of farm products and cropland are much more probable in the United States than are deficiencies.

COCHRANE, W. W., and LAMPE, H. C. The nature of the race between food supplies and demand in the United States 1951-75. Jour. Farm Econ. 35(2):203-222. May 1953.

An analysis is made of demand and supply to determine the nature of farm price trends over the 25-year period, 1951-75. Expansion of the domestic demand for food depends chiefly upon increases in population and income. The rate of expansion in farm output depends on weather and growing conditions, total inputs devoted to food production, and the rate of technological advance on farms. If average weather is assumed and no effective change occurs in total inputs in agriculture, then technological advance is the dominant element in expansion of aggregate output. Estimates are made of population and income (the determinants of demand expansion) and of food supplies for 1965 and 1975 under three alternative economic situations: (1) Chronic hot and cold wars, (2) continued peacetime prosperity, and (3) deflation and subsequent stagnation. Price-level consequences for food under each assumed situation are then determined. Under situation 1, food prices are estimated to be high, demand strong, and the relative economic position of farmers very good. Under situation 2, food prices at retail and prices received by farmers would decline gently but persistently over time. Extreme declines in prices received by farmers would occur under situation 3. The analysis indicates that food shortages for the United States are likely only under conditions of continued threat of war.

DALY, R. F. Demand for farm products at retail and farm level: some empirical measurements and related problems. Jour. Amer. Statis. Assoc. 53:656-668. September 1958.

Using a set of data on retail expenditures for food, the marketing bill, and the farm value of food, the article presents methodology and empirical measurements of price and income elasticities of demand, the flexibility of expenditures relative to income, and interrelationships among these elasticities. The income elasticity of demand for raw farm products going into food is very low; however, per capita expenditures for processed and packaged food at the retail level are fairly responsive to changes in consumer income.

DALY, R. F. Some considerations in appraising the long-run prospects for agriculture. Natl. Bur. Econ. Res., Inc., Studies in Income and Wealth 16:131-189. 1954.

Per capita use of food and other farm products was projected for 1970 under high employment and unemployment conditions. Projections of the aggregate per capita use of farm products were first appraised in the projected general economic framework, then compared with projections for individual commodities and groups of commodities. Supply response was also appraised in relation to growth in aggregate farm output, interindustry shifts of resources, output per man, and the shift from animal to machine power. These projections were then compared with detailed commodity analyses, which were related to demand, past output, acreage, capital, and other inputs and yields.

DEAN, G. W., and MCCORKLE, C. O., JR. Projections relating to California agriculture in 1975. Calif. Agr. Expt. Sta. Mimeo. Rpt. 234, 112 pp. July 1960.

Industrialization and population growth, which have proceeded at a rapid pace in California since 1940, have required large blocks of high-quality land for nonagricultural uses. In addition, competition for water between agricultural, industrial, and

human use had become severe. At the same time, consumption trends in the United States indicate increased demand for fruits, vegetables, and other specialty crops grown in California. An examination is made of changes in crop and livestock production, needs for additional land and water resources, and changes in operation of farms that will occur by 1975, given specific assumptions regarding world conditions, the U. S. economy, and California population. Total cropland acreage in California is projected to increase above 1954-57 by 0.8 million acres by 1975, with cotton expected to increase by 0.52 million acres, fruits by 0.35 million acres, feed grains by 0.30 million acres, and vegetables by 0.15 million acres. Food grains are projected to decrease by 0.13 million acres and beans by 0.05 million acres. Double cropping is expected to increase, and less cropland is expected to lie idle.

The 1975 livestock projections indicate 40 percent more dairy cows, 60 percent more hens, little change in numbers of beef cattle, turkeys and broilers, a 10-percent decline in sheep and lambs, and a 50-percent decline in hog numbers. Further development of water resources will be required to meet projected increases in irrigated acreage.

HEISIG, C. P. Long range production prospects and problems. Jour. Farm Econ. 35(5):744-753. December 1953.

This is a discussion of the prospects and problems of agricultural production for the period 1955-75. In the appraisal of long-term prospects for production, it was concluded that increases in yields of crops and livestock will form the chief basis for future expansion of farm production. Long-range prospects suggest that problems of matching supply and demand and related pricing and adjustment problems will not be too difficult to solve. During the intervening period, however, surpluses of several agricultural commodities present acute problems.

HEISIG, C. P. Long-term adjustments in composition of farm production and in production inputs. In U. S. Congress, Joint Economic Committee, Subcommittee on Agricultural Policy, Policy for commercial agriculture: its relation to economic growth and stability. Hearing, 85th Cong., 1st sess., pursuant to Sec. 5 (a) Public Law 304, 79th Cong., Dec. 16-20, 1957, pp. 53-73. Washington, 1957.

An appraisal is made of the direction and general degree of adjustments in major crops and livestock items that will likely be needed to balance farm output with market demands by about 1975 in view of possible increases in availability of cropland, increases in crop yields, and possible changes in efficiency of feed use by livestock. The implications of these adjustments on land use, size, and number of commercial farms, use of labor, and other production resources are explored. Major reliance for meeting production needs in 1975 will be on increasing yield and adoption of improved technology and farm practices. Increased size of farms, reduction in the number of commercial farms and in farm labor, and increased capital requirements are adjustments that can be expected in future years.

HEISIG, C. P. Trends in production, costs, and technology. U. S. Agr. Res. Serv., Washington, D. C., 1956. 18 pp., illus. A paper presented at the 34th Annual Agricultural Outlook Conference, Washington, D. C., Nov. 26, 1956.

An analysis and interpretation is made of the longer term outlook for agricultural production, costs, and technology. Under specific assumptions made with regard to growth in the economy and the upward trend in population, the volume of farm output needed in 1975 may be about one-third larger than the output in 1951-53. Increases

in needs for total livestock production may be about 45 percent above production in 1951-53. Realization of economic attainable yields by 1975 based on presently known technologies would result in the following changes in land use by 1975: (1) About 4 million fewer acres of corn than in 1956, (2) several million fewer acres of other feed grains, (3) 3 million fewer acres of soybeans, (4) no change from the 1956 acreage of wheat and cotton under allotment programs, (5) an increase of about 13 million acres in hay, and (6) an increase of about 35 million acres in pasture requirement in terms of cropland equivalent. It is concluded that it is possible to be fairly optimistic about the longer range outlook for farming, if we can work our way out of the current surplus situation and re-establish a reasonable balance between output and market requirements.

IBACH, D. B. Economic potentials of agricultural production. U. S. Agr. Res. Serv., Washington, D. C., 1960. 20 pp. A paper presented at a Seminar on Dynamics of Land Use: Needed Adjustment, the Center for Agricultural and Economic Adjustment, Iowa State University, Ames, Iowa, 1960.

The report is a discussion of the economic potentials of agricultural production and factors influencing these potentials including technology, managerial competence, available capital, supplies of needed inputs, and factor-product price relationships. The effects of changing technology on economic potentials is emphasized. The effect of technology on the competitive status of crops is noted. Crops that do not respond to technological improvements are likely to be replaced by substitutes of either natural or synthetic origin. Projected United States average crop yields, developed in other studies, are presented for major crops for 1980, and the needed acreage of each crop is determined for a projected population of 244 million. Increased use of fertilizer alone will result in substantial increases in crop yields, therefore economically potential yields are appreciably higher than the projected yields. Crops for which economically potential yields are considerably higher than projected yields include corn, hay, vegetables, and grain sorghum.

IBACH, D. B., and LINDBERG, R. C. The economic position of fertilizer use in the United States. U. S. Dept. Agr. Agr. Inform. Bul. 202, 31 pp., illus. November 1958.

The report presents (1) an evaluation of current fertilizer practices in the United States; (2) output at different fertilizer levels compared with projected needs for farm products; (3) alternative acreage-fertilizer combinations at which projected needs could be attained; (4) some examples of use of fertilizer to minimize unit costs in meeting projected needs; and (5) illustrations of optimum use of limited quantities of fertilizer in the cropping system. The last dollar spent per acre for fertilizer at the 1954 average rates of application on all crops and pasture returned an estimated $2.93. The output of all crops and pasture based on tentative estimates of yield response with 48 percent of the 1953-55 acreage fertilized at an average rate estimated to result in a marginal return of $2.00 (132 pounds of nutrients per acre), would be at a higher level than has been projected as needed by 1975 for a U. S. population of about 210 million.

JOHNSON, S. E. Agricultural outlook in the 1960's. U. S. Agr. Res. Serv., Washington, D. C., 1960. 28 pp., illus. A paper presented at the 38th Agricultural Outlook Conference, Washington, D. C., Nov. 14, 1960.

An analysis is made of agricultural prospects in the 1960's under the assumptions that: (1) Economic conditions that prevailed during the last half of the 1950's will

continue, (2) major farm programs now in operation will continue, (3) farmers will continue to adopt known technology at about the same rate as in recent years, and (4) average weather will prevail. A 10-percent increase in population above 1959 is visualized for 1965. This, in addition to a 10- to 15-percent increase in disposable income, results in a projected increase in total domestic use of agricultural products of about 11 percent, with largest gains expected in the use of livestock products. The volume of U. S. agricultural exports by 1965 is projected at about 20 percent above 1959. Farm output in 1965 is projected at a level of from 6 to 10 percent above the 1959 level, with production of livestock projected at nearly 10 percent and crop production at 4 to 9 percent above 1959. Considering market outlets and productive capacity in the aggregate, a surplus capacity of 15 to 25 million acres of cropland is visualized by 1965.

JOHNSON, S. E. Prospects and requirements for increased output. Jour. Farm Econ. 34(5):682-694. December 1952.

An analysis is made of the prospective requirements and prospects for achieving output needed by 1975, assuming (1) progress toward peacetime conditions and (2) a high level of employment and industrial activity. The three major elements on the requirement side are the level of population, per capita consumption of both food and nonfood farm products, and the level of exports and imports. Projections assumed a 1975 population of 190 million. Demand for farm products is likely to increase 30 to 40 percent from 1950. It seems safe to conclude that with the improved techniques that are now known and fairly well tested, and certainly with further improvements that seem to be on the horizon, farm output can be expanded by 1975 to meet forseeable demands without encountering higher costs per unit of output.

ROGERS, R. O., and BARTON, G. T. Our farm production potential, 1975. U. S. Dept. Agr. Agr. Inform. Bul. 233, 14 pp., illus. September 1960.

To determine farm production potential in the United States, two levels of yield per harvested acre of each major crop were projected: (1) The economic maximum yield, which is based on full, efficient economic application of presently known technology under assumed economic conditions, and (2) the economic attainable yields, which are yields that would be expected by 1975, from actual application by farmers of presently known technology. Achievement of projected economic attainable yields in 1975 would result in an average per acre crop production 35 percent above that of 1951-53, and 20 percent greater than in 1956-58. Projected economic maximum yields for 1975 are 15 percent greater than the projected attainable yields. The analysis indicates that the present productive capacity of agriculture is sufficient to meet the projected 1975 needs for food and fiber of a United States population of 230 million and to provide for a relatively high level of exports.

SHAW, B. T. Land resources for increased agricultural output. Jour. Farm Econ. 34(5):673-681. December 1952.

An appraisal is made of the productive capacity of American agriculture and its ability to meet the needs of the future. A target date of 1975 is used, economic conditions are assumed to be favorable, and the export-import factor is held constant. Assuming that the 1950 diets will be maintained in 1975 for a population of 190 million, we will need the cropland equivalent (expressed in terms of 1950 per acre yields) of 577 million acres, or an increase of 115 million above the 462 million available to provide for domestic consumption in 1950. If gains in diet improvement equivalent

to those achieved from 1935-39 to 1950 are realized, an additional 50 million acres of cropland equivalent will be required. Only a limited expansion in land resources is likely, so the best approach for making up this deficit appears to lie in obtaining higher yields on land presently in use. A substantial increase in production could be achieved if all farmers were to use the most advanced practices known, but it is vital that we continue to extend our inventory of advanced practices to meet probable demands in the future.

STEWART, H. L. Prospects for adjustments in production and resource use. U. S. Agr. Res. Serv., Washington, 1958. 25 pp., illus. A paper presented at the 36th Agricultural Outlook Conference, Washington, D. C., Nov. 18, 1958.

Despite increases in demand and expenditures for programs designed to encourage adjustments, rates of return for similar services in agriculture have not been comparable to those of the nonfarm sector of the economy. Restrictions on acreages of important crops have resulted in increased production of alternative enterprises. As the demand for agricultural products is relatively inelastic, and total farm production is 5 to 6 percent in excess of demand, there is little chance of bringing production into balance with demand merely by shifting from one enterprise to another. Consequently, further adjustments will be necessary in the future. To feed the projected 1975 population of 230 million, total crop production of 28 percent and total livestock production of 40 percent above 1956 levels will be needed. With a 1951-53 cropping pattern, economic attainable crop yields by 1975 would average 40 percent above the 1951-53 base. Attainable gains of 7 to 27 percent in production per animal and an increase in feeding efficiency of 10 to 12 percent are estimated. If these attainable crop and livestock yields and changes in feeding efficiency are achieved, there will be little doubt as to our ability to meet the projected output needs of 1975. It seems that our adjustment problems will be with us during the next two decades, and a better allocation of resources both within agriculture and between agriculture and other sectors of the economy will be necessary.

U. S. CONGRESS. HOUSE. COMMITTEE ON AGRICULTURE. Agricultural production. In its Long-range agricultural policy: a study of selected trends and factors relating to the long-range prospect for American agriculture. Report printed as Committee Print, 80th Cong., 2d sess., pp. 43-48. 1948.

An analysis is made of agricultural production prospects for the period 1948 to 1965. Estimates were made of total crop production for 1955, 1965, and 1975. The estimates were for indexes of total crop production of 133 in 1965 and an index of total output of about 138 in 1955, 148 in 1965 and about 160 in 1975, with 1935-39 equal to 100. Approximate yields of important crops, associated with the index of crop production per acre of 133, are presented for 1965. The outlook was for increased yields resulting from use of greater quantities of fertilizer, better cultural practices, and improved varieties. A further increase in total production also would come from several million acres of new land that were projected to be brought into production through irrigation, drainage, and clearing.

U. S. CONGRESS. SENATE. SELECT COMMITTEE ON NATIONAL WATER RESOURCES. Water resource activities in the United States: land and water potentials and future requirements for water. Report, printed as Committee Print 12, 86th Cong., 1st sess., pursuant to S. Res. 48, 73 pp., illus. 1960.

The report includes an estimate of land and water use under three projected levels of population and economic growth. Total requirements for farm products by 1980 and 2000 are based on projected population numbers, continued improvements in

level of diet, and projected levels of exports and imports. Estimates were made of production increases that could be obtained from projected crop and pasture yields on both irrigated and nonirrigated land. For the low level of population projections, the increase in yields projected for crops and pasture nearly meets requirements, with only limited land and water development needed to replace losses to nonfarm uses. For the medium-level population projections, more land would be shifted to nonfarm uses and requirements would be higher also. Thus to make up a calculated deficit between projected production and requirements of $7 billion in 1980 and $12.5 billion in 2000 (as measured in 1947-49 dollars), more land and water development or other means of increasing output would be needed. For the high level of population projections, the 1980 deficit is $11.5 billion and the 2000 deficit is $25.5 billion. Increased emphasis on land and water development and on other methods of increasing output would be needed to meet these requirements.

U. S. CONGRESS. SENATE. U. S. DEPARTMENT OF AGRICULTURE AND LAND GRANT COLLEGES IRM-1 ADVISORY COMMITTEE. Farm price and income projections 1960-65 under conditions approximating free production and marketing of agricultural commodities, presented by A. J. Ellender. Report, 86th Cong., 2d sess., S. Doc. 77, 30 pp. 1960.

An analysis is made of probable market supplies and prices of the major farm products and the probable aggregate farm output and level of farm prices for the period 1960-65. Chief assumptions were that all production controls except those on tobacco would be removed, and that price supports would be maintained at levels that would permit an orderly reduction of the current excessive stocks of storable farm products over a 7- to 10-year period. The projected acreages planted and harvested, yields, and prices received are presented for each major crop, and prices are presented for livestock groups for each year, 1960-65. Total farm output would be expected to increase to 137 percent of the 1947-49 average by 1965, or 20 percent above the 1955-57 average. The increase above 1955-57 in output of livestock would be 25 percent and that for crops would be 16 percent. The effects on net farm income are estimated for specific farming situations. Net farm income of specialized wheat producers would be affected most adversely and beef cattle producers would be least affected.

U. S. DEPARTMENT OF AGRICULTURE. Agricultural programs of the United States – current and prospective. A Report to the Food and Agricultural Organization of the United Nations. 64 pp., illus. U. S. Govt. Print. Off., Washington, D. C. November 1952.

In this study, consideration is given to U. S. requirements for food and fiber and production potential. Long-range prospects are for continued expansion in both per capita consumption and our total requirements. Projections of trends to 1975 indicate a possible growth of 25 percent in population above the 1950 level and about a doubling of the total output of the economy. If these trends were to materialize, it would mean, conservatively, an increase in domestic requirements and exports of about 35 percent above the 1947-49 level and about 30 percent above 1951. The possibilities for expanding future farm output will depend mainly on developments with respect to changes in (1) the cropland area, (2) crop yields, (3) production per livestock unit, and (4) productivity of farm labor. The discussion indicates that economic possibilities for expanding the cropland area are limited possibly to no more than 6 percent above the 1950 level. Increases in the other three factors are possible and likely. Projection of trends to 1975 would bring increases in crop

yields of 25 percent, in livestock per breeding unit of 14 percent, and in man-hour productivity of about 50 percent above the 1950 level. If these changes should occur, resulting farm output would be 35 percent above the 1947-49 level and would about balance the projected domestic and foreign demand.

U. S. DEPARTMENT OF AGRICULTURE. A 50-year look ahead at U. S. agriculture. 20 pp. Washington, D. C. June 1959.

An analysis is made of the probable requirements for agricultural products in 2010, the yields that might be expected by that time, the acreage of land that would be required, and the acreage of land that may be available for use. The analysis is based on specific assumptions relating to population, economic growth, technology, and trends in per capita use of farm products. Domestic utilization of farm products in 2010 for a population of 370 million is projected to a level about 2.4 times as large as in 1956. Assuming projected requirements for farm products, economic attainable yields, and an export level of 1956, a net increase of about 122 million acres of cropland would be needed by 2010 to replace 25 million acres taken up by urban and other uses and 97 million acres required for agricultural production. For a population of 300 million, economic attainable yields, and an export level 152 percent above 1956, no additional cropland would be needed to replace land absorbed by urban and similar uses. A population of 440 million, economic maximum yields, and the export level of 1956 would require 230 million additional acres of cropland.

U. S. DEPARTMENT OF AGRICULTURE. What peace can mean to American farmers. Post-war agriculture and employment. U. S. Dept. Agr. Misc. Pub. 562, 28 pp. May 1945. /One of a series of four reports on "What peace can mean to American farmers" by the U. S. Department of Agriculture./

Projections of demand for food and production were made under the assumption of full employment in the economy to determine the probable economic position of agriculture after the war. Estimates were made of the quantities of each of several products that would be exported and imported and the quantity that would be required for domestic consumption. Yields of various products were estimated for two levels of technology, average and improved. With improved technology, the projected 1950 food requirements could be met on less total cropland than was cultivated in 1943, and the possibility that production might outrun demand was visualized. Under conditions of less than full employment, farm prices and income would be depressed.

U. S. BUREAU OF AGRICULTURAL ECONOMICS. Agriculture's capacity to produce. Possibilities under specified conditions. U. S. Dept. Agr. Agr. Inform. Bul. 88, 62 pp., illus. June 1952.

This is an appraisal of U. S. agriculture's productive capacity indicating that by 1955, if necessary, total farm output could exceed the 1950 level by about 20 percent. Projections were that a marked increase in number of machines, changes in land use, a large increase in fertilizer used, and use of improved cropping and livestock practices would be necessary to attain a 20-percent rise in farm output. Estimates were made by broad regions, as well as for the Nation as a whole.

WOOTEN, H. H., and ANDERSON, J. R. Agricultural land resources in the United States, with special reference to present and potential cropland and pasture. U. S. Dept. Agr. Agr. Inform. Bul. 140, 107 pp., illus. June 1955.

Projection of the recent trend in development and conversion of land indicates that the total area of U. S. cropland may reach 508 million acres by 1975, an increase of

6 percent over the 478 million acres in 1950. Approximately half of this increase will come through transfer of some of the best soil areas now in permanent grassland pasture to the cropland rotation. An increase of 75 million acres in improved permanent pasture is probable, but total land available for pasture and grazing may decline by 1975. Factors contributing to a decrease in the acreage of pasture and grazing land are (1) shifting of grassland pasture to cropland, (2) natural reforestation, (3) restriction of forest grazing, and (4) closing of depleted areas to grazing. Total forest area may remain at the present level as clearing and reforestation may be offsetting.

WOOTEN, H. H., and ANDERSON, J. R. Land inventory and land requirements in the United States. Jour. Soil and Water Conserv. 12(2):60-64. January 1957.

An analysis is made of the use of land for agricultural purposes and the possible effect of the growth of United States population on land requirements by 1975. Growth in population to 210 million by 1975 will contribute much to increased demand for agricultural products in the next two decades. With the growth in population and the somewhat greater demand for farm products, moderate shifts from pasture and forest to cropland are expected. If recent trends continue in the next 25 years, 20 to 30 million acres of permanent grassland suitable for cultivation likely will be brought into the cropland-pasture rotation. The total area of pasture and grazing land may remain about the same as at present, as a considerable acreage of pasture will likely be shifted to rotation pasture in the cropland rotation. Although large acreages of grassland and woodland are suitable for improvement as cropland, chief reliance on meeting production needs by 1975 probably will depend on increased crop and pasture production per acre.

Some older agricultural production projection studies for which summaries are omitted include:

CARLETON, M. A. The future wheat supply of the United States. U. S. Dept. Agr. Yearbook 1909:259-272.

GRAY, L. C., and others. The utilization of our lands for crops, pasture and forests. U. S. Dept. Agr. Yearbook 1923:415-506.

U. S. NATIONAL RESOURCES BOARD. Agricultural land requirements and available resources. In its Supplementary Report of the Land Planning Committee, vol. 1, pt. 3. Washington, D. C. 1935.

U. S. NATIONAL RESOURCES PLANNING BOARD. Report on national planning and public works. . . . Part 2, Report of the Land Planning Committee. Washington, D. C. 1934.

Growth Through Agricultural Progress